Section I. (Amendment to the Claims)

1. (Currently Amended) A supercritical fluid (SCF) based composition comprising at least one co-solvent, at least one etchant species, at least one surface passivator, a binder interactive with silicon-containing particulate material to enhance removal thereof, deionized water, and optionally at least one surfactant, wherein said binder ~~comprises a polymeric species~~ is derived from at least one ethylenically unsaturated reactant, and wherein said composition is useful for removing silicon-containing particulate material from the surface of a semiconductor wafer.

2. (Previously Presented) The composition of claim 1, wherein the SCF-based composition comprises a SCF selected from the group consisting of carbon dioxide, oxygen, argon, krypton, xenon, and ammonia.

3. (Previously Presented) The composition of claim 2, wherein the SCF comprises carbon dioxide.

4. (Currently Amended) The composition of claim 1, wherein the co-solvent comprises at least one solvent selected from the group consisting of alkanols, dimethylsulfoxide, sulfolane, catechol, ethyl lactate, acetone, butyl carbitol, monoethanolamine, butyrol lactone, alkyl carbonates, glycol amines, and a mixture of two or ~~of~~ more of such species.

5. (Previously Presented) The composition of claim 1, wherein the co-solvent comprises at least one C_1-C_6 alkanol.

6. (Original) The composition of claim 1, wherein the co-solvent comprises methanol.

7. (Original) The composition of claim 1, wherein the silicon-containing particulate material comprises silicon nitride.

8. (Original) The composition of claim 1, wherein the silicon-containing particulate material comprises silicon oxide.

9. (Original) The composition of claim 1, wherein the etchant species is selected from the group consisting of hydrofluoric acid, ammonium fluoride, triethylamine trihydrofluoride and bifluoride salts.

10. (Original) The composition of claim 9, wherein the etchant species comprises ammonium fluoride.

11. (Previously Presented) The composition of claim 1, wherein the composition comprises a surfactant.

12. (Previously Presented) The composition of claim 11, wherein the surfactant comprises at least one surfactant selected from the group consisting of fluoroalkyl surfactants, ethoxylated fluorosurfactants, polyethylene glycols, polypropylene glycols, polyethylene ethers, polypropylene glycol ethers, carboxylic acid salts, dodecylbenzenesulfonic acid, dodecylbenzenesulfonic salts, polyacrylate polymers, dinonylphenyl polyoxyethylene, silicone polymers, modified silicone polymers, acetylenic diols, modified acetylenic diols, alkylammonium salts, modified alkylammonium salts, and combinations thereof.

13. (Original) The composition of claim 11, wherein the surfactant comprises at least one anionic surfactant selected from the group consisting of fluorosurfactants, sodium alkyl sulfates, ammonium alkyl sulfates, alkyl (C_{10}-C_{18}) carboxylic acid ammonium salts, sodium sulfosuccinates and esters thereof, and alkyl (C_{10}-C_{18}) sulfonic acid sodium salts.

14. (Original) The composition of claim 11, wherein the surfactant comprises an ethoxylated fluorosurfactant.

15. (Original) The composition of claim 1, wherein the interactions between the binder and the silicon-containing particulate material comprise intermolecular interactions selected from the group consisting of hydrogen bonding and van der Waals forces.

16. (Original) The composition of claim 1, wherein the binder comprises a polyvinyl alcohol derived from at least one ethylenically unsaturated reactant.

17. (Cancelled)

18. (Original) The composition of claim 1, wherein the binder comprises a polyvinyl amine derived from at least one ethylenically unsaturated reactant.

19. (Cancelled)

20. (Previously Presented) The composition of claim 1, wherein interactions between the binder and the silicon-containing particulate material reduce the silicon-containing particulate material count on the surface of the semiconductor wafer.

21. (Original) The composition of claim 1, wherein the surface passivator is selected from the group consisting of boric acid, triethyl borate and triethanolamine.

22. (Original) The composition of claim 1, wherein the surface passivator comprises boric acid.

23. (Original) The composition of claim 1, wherein the composition comprises about 75.0% to about 99.9% SCF, about 0.05% to about 22.5% co-solvent, about 0.01% to about 5.0% etchant, about 0.01% to about 1.25% surface passivator, about 0.01% to about 3.75% binder, 0% to about 1.25% surfactant and about 0.01% to about 3.5% deionized water, based on the total weight of the composition.

24. (Original) The composition of claim 23, wherein the ratio of etchant to surface passivator is about 2:3 to about 4:3.

25. (Currently Amended) A method of removing silicon-containing particulate matter from a semiconductor wafer surface having same thereon, said method comprising contacting the wafer surface with a SCF-based composition comprising at least one co-solvent, at least one etchant species, at least one surface passivator, a binder interactive with said silicon-containing particulate matter ~~material~~ to enhance removal thereof, deionized water, and optionally at least one surfactant, for sufficient time and under sufficient contacting conditions to remove the silicon-containing particulate matter from the surface of the semiconductor wafer, wherein said binder ~~comprises a polymeric species~~ is derived from at least one ethylenically unsaturated reactant.

26. (Previously Presented) The method of claim 25, wherein the SCF-based composition comprises an SCF selected from the group consisting of carbon dioxide, oxygen, argon, krypton, xenon, and ammonia.

27. (Previously Presented) The method of claim 26, wherein the SCF comprises carbon dioxide.

28. (Original) The method of claim 25, wherein the contacting conditions comprise pressures in a range of from about 1200 to about 4500 psi.

29. (Original) The method of claim 25, wherein said contacting time is in a range of from about 4 minutes to about 20 minutes.

30. (Previously Presented) The method of claim 25, wherein the co-solvent comprises at least one solvent selected from the group consisting of alkanols, dimethylsulfoxide, sulfolane, catechol, ethyl lactate, acetone, butyl carbitol, monoethanolamine, butyrol lactone, alkyl carbonates, glycol amines, and a mixture of two of more of such species.

31. (Original) The method of claim 25, wherein the co-solvent comprises at least one C_1-C_6 alcohol.

32. (Original) The method of claim 25, wherein the silicon-containing particulate matter comprises silicon nitride.

33. (Original) The method of claim 25, wherein the silicon-containing particulate matter comprises silicon oxide.

34. (Previously Presented) The method of claim 32, wherein the silicon nitride particles are generated during plasma-enhanced chemical vapor deposition (PECVD) of a silicon-containing material at the semiconductor wafer surface.

35. (Original) The method of claim 25, wherein the etchant species is selected from the group consisting of hydrofluoric acid, ammonium fluoride, triethylamine trihydrofluoride and bifluoride salts.

36. (Original) The method of claim 25, wherein the etchant species comprises ammonium fluoride.

37. (Previously Presented) The method of claim 25, wherein the SCF-based composition comprises a surfactant.

38. (Previously Presented) The method of claim 37, wherein the surfactant comprises at least one surfactant selected from the group consisting of fluoroalkyl surfactants, ethoxylated fluorosurfactants, polyethylene glycols, polypropylene glycols, polyethylene ethers, polypropylene glycol ethers, carboxylic acid salts, dodecylbenzenesulfonic acid, dodecylbenzenesulfonic salts, polyacrylate polymers, dinonylphenyl polyoxyethylene, silicone polymers, modified silicone polymers, acetylenic diols, modified acetylenic diols, alkylammonium salts, modified alkylammonium salts, and combinations thereof.

39. (Original) The method of claim 37, wherein the surfactant comprises at least one anionic surfactant selected from the group consisting of fluorosurfactants, sodium alkyl sulfates, ammonium alkyl sulfates, alkyl (C_{10}-C_{18}) carboxylic acid ammonium salts, sodium sulfosuccinates and esters thereof, and alkyl (C_{10}-C_{18}) sulfonic acid sodium salts.

40. (Previously Presented) The method of claim 25, wherein interactions between the binder and the silicon-containing particulate material comprise intermolecular interactions selected from the group consisting of hydrogen bonding and van der Waals forces.

41. (Original) The method of claim 25, wherein the binder comprises polyvinyl alcohol derived from at least one ethylenically unsaturated reactant.

42. (Cancelled)

43. (Original) The method of claim 25, wherein the binder comprises polyvinyl amine derived from at least one ethylenically unsaturated reactant.

44. (Cancelled)

45. (Currently Amended) The method of claim 41, wherein the ~~polymeric~~ polyvinyl alcohol adsorbs to silazane (Si_2-NH) and/or silanol (Si-OH) groups at the surface of the silicon-containing particulate material.

46. (Original) The method of claim 25, wherein the surface passivator is selected from the group consisting of boric acid, triethyl borate and triethanolamine.

47. (Original) The method of claim 25, wherein the surface passivator comprises boric acid.

48. (Original) The method of claim 25, wherein the SCF-based composition comprises about 75.0% to about 99.9% SCF, about 0.05% to about 22.5% co-solvent, about 0.01% to about 5.0% etchant, about 0.01% to about 1.25% surface passivator, about 0.01% to about 3.75% binder, 0% to about 1.25% surfactant and about 0.01% to about 3.5% deionized water, based on the total weight of the composition.

49. (Original) The method of claim 25, wherein the contacting step comprises a cycle including (i) dynamic flow contacting of the SCF-based composition with the wafer surface containing the silicon-containing particulate material, and (ii) static soaking contacting of the SCF-based composition with the wafer surface containing the silicon-containing particulate material.

50. (Previously Presented) The method of claim 49, wherein said cycle comprises alternatingly and repetitively carrying out dynamic flow contacting and static soak contacting of the wafer surface containing the silicon-containing particulate material.

51. (Original) The method of claim 25, wherein the contacting conditions comprise temperatures in a range from about 30°C to about 100°C.

52. (Original) The method of claim 25, wherein the contacting conditions comprise temperatures in a range from about 40°C to about 70°C.

53. (Original) The method of claim 25, further comprising the step of washing the wafer surface, at a region at which the silicon-containing particulate material have been removed, with a SCF/methanol/deionized water wash solution in a first washing step, and with a SCF in a second washing step, to remove residual precipitated chemical additives in said first washing step, and to remove residual precipitated chemical additives and/or residual alcohol in said second washing step.

54. (Original) The method of claim 53, wherein the SCF is $SCCO_2$.

55. (Currently Amended) The method of claim 56, wherein the SCF-based composition ~~comprising~~ comprises $SCCO_2$, N-methylpyrollidone (NMP), triethylamine trihydrofluoride, and dioctyl sodium sulfosuccinate~~, wherein said composition is useful for removing silicon-containing particulate material from the surface of a semiconductor wafer~~.

56. (Currently Amended) A method of removing silicon-containing particulate matter from a semiconductor wafer surface having same thereon, said method comprising:

pre-cleaning the wafer surface with a SCF-based pre-cleaning composition comprising ~~a~~ ~~SCF~~ supercritical carbon dioxide ($SCCO_2$) and an aqueous-based pre-cleaning formulation, wherein the aqueous-based pre-cleaning formulation comprises an oxidizing agent and the $SCCO_2$ comprises at least 95 wt% of the SCF-based pre-cleaning composition, based on the total weight of the pre-cleaning composition; and

contacting the wafer surface with a SCF-based composition comprising a SCF, at least one co-solvent, at least one etchant species, and optionally at least one surfactant, for sufficient time and under sufficient contacting conditions to remove the silicon-containing particulate matter from the surface of the semiconductor wafer.

57. (Original) The method of claim 56, wherein the aqueous-based pre-cleaning formulation comprises ammonium hydroxide, t-butyl hydrogen peroxide and water.

58. (Original) The method of claim 56, wherein the wafer surface is pre-cleaned in a pressure range from about 1200 psi to about 2900 psi.

59. (Original) The method of claim 56, wherein the wafer surface is pre-cleaned in a temperature range from about 40°C to about 60°C.

60. (Previously Presented) The composition of claim 1 further comprising silicon-containing particulate material.

61. (Previously Presented) The method of claim 25, wherein the SCF-based composition further comprises silicon-containing particulate material.

62. (Currently Amended) A composition comprising a supercritical fluid (SCF), silicon-containing particulate material residue, and a binder interactive with said silicon-containing

particulate material to enhance removal thereof, wherein said binder comprises a ~~polymeric species derived from at least one ethylenically unsaturated reactant, said polymeric~~ species selected from the group consisting of [[a]] polymeric alcohol and [[a]] polymeric amine, and wherein said composition is useful for removing silicon-containing particulate material from the surface of a semiconductor wafer, and wherein the silicon-containing particulate material residue comprises a species selected from the group consisting of silicon nitride, silicon oxide, and hydrogenated silicon nitride.

63. (Currently Amended) The composition of claim 62, ~~wherein the silicon-containing particulate material residue comprises a species selected from the group consisting of silicon nitride, silicon oxide, and hydrogenated silicon nitride~~ further comprising at least one fluoride-containing etchant selected from the group consisting of hydrofluoric acid, ammonium fluoride, triethylamine trihydrofluoride and bifluoride salts.